

R E M A R K S

This paper is submitted responsive to the Official Action mailed January 28, 2003 and having a shortened statutory period for response set to expire on April 28, 2003.

Reconsideration of the application in light of the accompanying remarks and amendments is respectfully requested.

In the aforesaid action, the Examiner rejected various claims of the application as anticipated by U.S. Patent No. 5,209,076 to Kauffman et al., and rejected other claims as obviated by a combination of Kauffman et al. with U.S. Patent No. 5,772,403 to Allison et al., and with U.S. Patent No. 5,946,925 to Williams et al.

In accordance with the present invention, a system and method are provided whereby specific sensor input is obtained from a compressor during operation, and this input is fed to a protection module which is adapted to detect conditions requiring immediate and/or prognostic actions.

In instances where immediate protection is needed, the compressor can be shut down. In other conditions, prognostic protection is appropriate and operation of the compressor can be continued, perhaps at different operating

parameters, while a call for maintenance is issued so that the problem can be addressed without interruption of the compressor.

The independent claims of the application have been amended so as to indicate that the control actions include immediate protection actions as well as prognostic protection actions, and it is noted that the reference cited by the Examiner do not appear to disclose or suggest the prognostic actions which are set forth in the present claims and which are an advantageous feature of the present invention.

For example, Kauffman et al. repeatedly refers to alarm conditions and failure modes wherein the compressor is shut down. The system enters this mode after a particular condition is detected and remains in that state for a "time out". Thus, there is apparently no operation in this system between normal operation and shut down, and this is a problem which is specifically solved by the subject matter of the present invention.

Independent claims 1, 17 and 24 have each been amended so as to recite this subject matter, and these claims are submitted to be patentable over the art of record.

In addition to the foregoing, dependent claims 4, 20 and 29 have been drafted in independent form, and are likewise submitted to contain patentable subject matter. Each of these claims sets forth that the plurality of potential control actions to be taken include a compressor shut down command, an operation parameter adjusting command and a command for indicating that maintenance is needed. It is respectfully submitted that the art of record does not disclose each of these different types of commands which, as discussed above, allow for continued operation while maintenance is sought for conditions which require only prognostic attention. Based upon the foregoing, each of these claims is likewise submitted to contain patentable subject matter.

Dependent claim 14 has been amended to independent form, and is also submitted to be patentable over the art of record. This claim calls for a liquid injection valve on the compressor, and for the control member to be adapted to open the liquid injection valve when discharge temperature is greater than a particular set point. The Examiner has asserted that William et al. '925 teaches this subject matter, and references a parallel arrangement of a bypass valve 34 and a liquid injection valve 36. Although

this system does appear to include a liquid injection valve, there is no disclosure or suggestion to operatively associate the liquid injection valve with a control member which can control the liquid injection valve based upon input received from various sensors, as set forth in claim 14 of the present application. Thus, it is respectfully submitted that this claim is also patentable over the art of record.

Dependent claims 2-3, 5-13, 15-16, 18-19, 21-23, 25-28 and 30-33 all depend directly or indirectly from the independent claims discussed above, and are submitted to be patentable based upon this dependence, as well as in their own right.

Based upon the foregoing, it is respectfully submitted that the claims of the present application are in condition for allowance, and such early and favorable action is therefore respectfully submitted.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding

issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

The Commissioner is hereby authorized to charge Applicants' Attorney's Deposit Account No. 02-0184 in the amount of \$252.00 to cover the fee for three (3) extra independent claims.

If any additional fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,

MICHAEL COLLINS

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231

on 4/28/2003
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1, 4, 14, 17, 20, 24 and 29 have been amended
as follows:

1. (Amended) An apparatus for monitoring a
compressor, comprising:

a plurality of sensor inputs for receiving input
regarding operating parameters of a compressor;

at least one control action output for sending a
control action to said compressor; and

a control member communicated with said plurality of
sensor inputs and said control action output, said control
member being adapted to analyze input from said plurality
of sensor inputs, to determine a control action based upon
said input and to send said control action to said at least
one control action output, wherein said control action
includes actions for immediate protection, wherein a
control action to shut down said compressor is issued, and
control actions for prognostic protection, wherein a
signal is issued while said compressor is continued to be
operated.

4. (Amended) [The apparatus of claim 3] An apparatus for monitoring a compressor, comprising:

a plurality of sensor inputs for receiving input regarding operating parameters of a compressor;

at least one control action output for sending a control action to said compressor; and

a control member communicated with said plurality of sensor inputs and said control action output, said control member being adapted to analyze input from said plurality of sensor inputs, to determine a control action based upon said input and to send said control action to said at least one control action output, wherein said control member is adapted to receive input comprising compressor discharge pressure, compressor discharge temperature, compressor suction pressure, compressor suction temperature, oil pressure and a compressor on/off input signal, wherein said control member includes a memory storing a plurality of potential control actions, a plurality of adjustable operating parameters and a plurality of sensor input value combinations corresponding to said plurality of potential control actions, and a processor adapted to compare said input to said sensor input value combinations and select said control action from said plurality of control actions,

wherein said plurality of potential control actions includes a compressor shut down command, operation parameter adjusting commands and commands for indicating that maintenance is needed.

14. (Amended) [The apparatus of claim 13] An apparatus for monitoring a compressor, comprising:

a plurality of sensor inputs for receiving input regarding operating parameters of a compressor;

at least one control action output for sending a control action to said compressor; and

a control member communicated with said plurality of sensor inputs and said control action output, said control member being adapted to analyze input from said plurality of sensor inputs, to determine a control action based upon said input and to send said control action to said at least one control action output, wherein said control member is adapted to compare discharge temperature from said input to a discharge temperature set point and to control a liquid injection valve on said compressor based upon results of the comparison, wherein said control member is adapted to open said liquid injection valve when said discharge temperature is greater than said set point.

17. (Amended) A method for monitoring a compressor, comprising the steps of:

obtaining input regarding a plurality of compressor operating parameters;

feeding said input to a control member;

analyzing said input with said control member to determine a control action based upon said input; and

carrying out said control action on said compressor, wherein said control action includes actions for immediate protection, wherein a control action to shut down said compressor is issued, and control actions for prognostic protection, wherein a signal is issued while said compressor is continued to be operated.

20. (Amended) [The method of claim 19] A method for monitoring a compressor, comprising the steps of:

obtaining input regarding a plurality of compressor operating parameters;

feeding said input to a control member;

analyzing said input with said control member to determine a control action based upon said input; and

carrying out said control action on said compressor, wherein said plurality of potential control actions include

a compressor shut down command, operation parameter
adjusting commands and commands for indicating that
maintenance is needed, wherein said input comprises
compressor discharge pressure, compressor discharge
temperature, compressor suction pressure, compressor
suction temperature, oil pressure and a compressor on/off
input signal, wherein said control member includes a memory
storing a plurality of potential control actions and a
plurality of sensor input value combinations corresponding
to said plurality of potential control actions; and wherein
said control member selects said control action from said
plurality of potential control actions, wherein said
plurality of potential control actions include a compressor
shut down command, operation parameter adjusting commands
and commands for indicating that maintenance is needed.

24. (Amended) In combination, a compressor and
control module system, comprising:

a compressor; and

a control module comprising a plurality of sensor
inputs for receiving input from said compressor; at least
one control action output for conveying control actions to
said compressor; and a control member communicated with

said plurality of sensor inputs and said control action output, said control member being adapted to analyze input from said plurality of sensor inputs, to determine a control action based upon said input and to send said control action to said at least one control action output, wherein said control action includes actions for immediate protection, wherein a control action to shut down said compressor is issued, and control actions for prognostic protection, wherein a signal is issued while said compressor is continued to be operated.

29. (Amended) [The system of claim 28] In combination, a compressor and control module system, comprising:

a compressor; and

a control module comprising a plurality of sensor inputs for receiving input from said compressor; at least one control action output for conveying control actions to said compressor; and a control member communicated with said plurality of sensor inputs and said control action output, said control member being adapted to analyze input from said plurality of sensor inputs, to determine a control action based upon said input and to send said

control action to said at least one control action output,
wherein said control member includes a memory storing a
plurality of potential control actions and a plurality of
sensor input combinations corresponding to said plurality
of potential control actions, wherein said plurality of
potential control actions include a compressor shut down
command, operation parameter adjusting commands and
commands for indicating that maintenance is needed.